Booster Jaw Bar

Igor Novitski

Material properties

- c*********
- c********* material properties
- c********* Metals for FE AISI 304 from MatWeb
- c*********
- !
- alro=7.870 !density , g/cc

- kxx,1,16.2 ! Thermal conductivity W/m-K 16.2
- dens,1,alro*1e3 ! Density kg/m3
- alpx,1,17.3e-6 ! CTE 1/K
- c,1,500 ! Specific heat J/kg-K 450-500
- ex,1,200e9
- !
- kxx,2,16.2
- dens,2,alro*1e3
- alpx,2,17.3e-6
- c,2,500
- ex,2,200e9

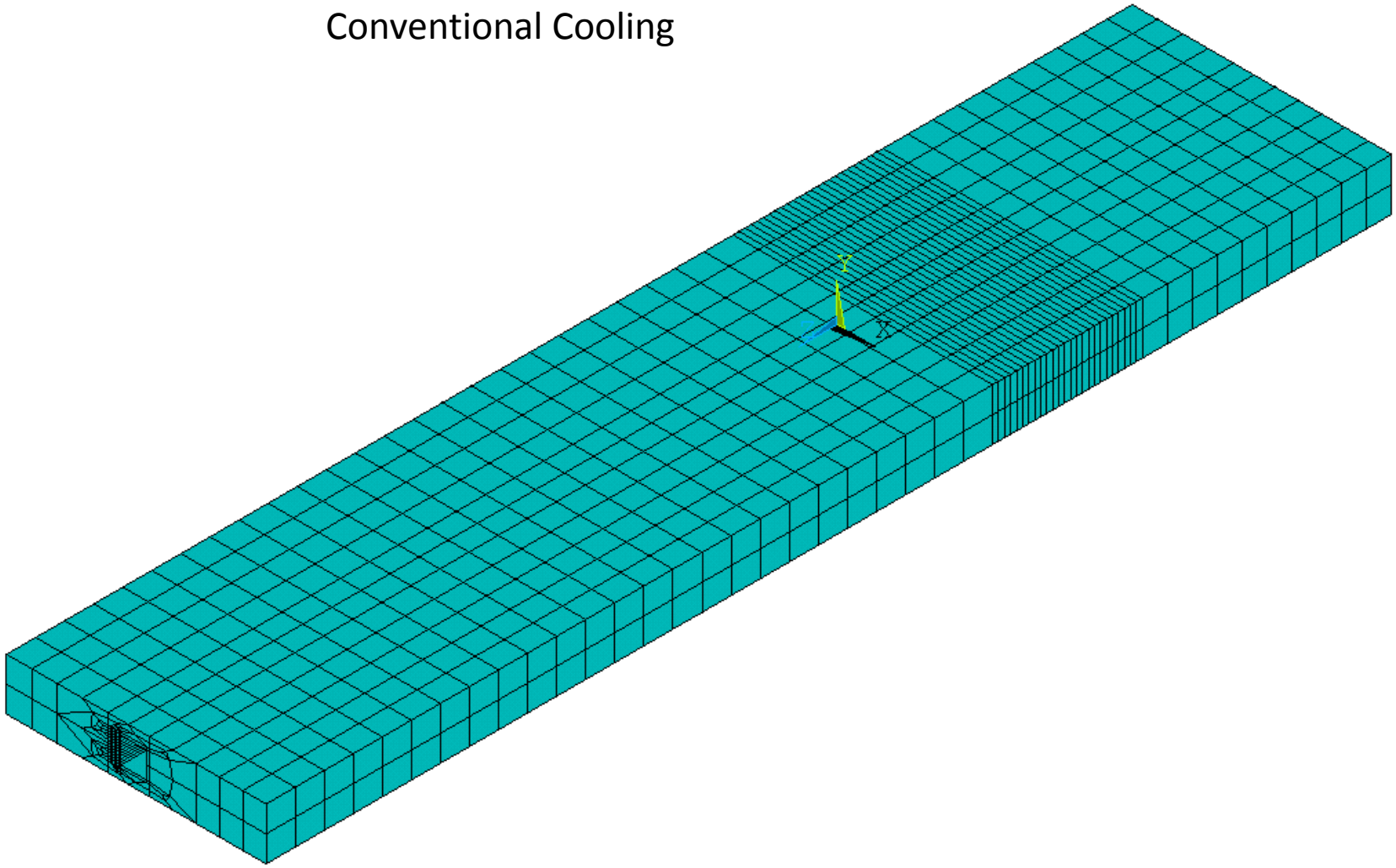
1

ELEMENTS

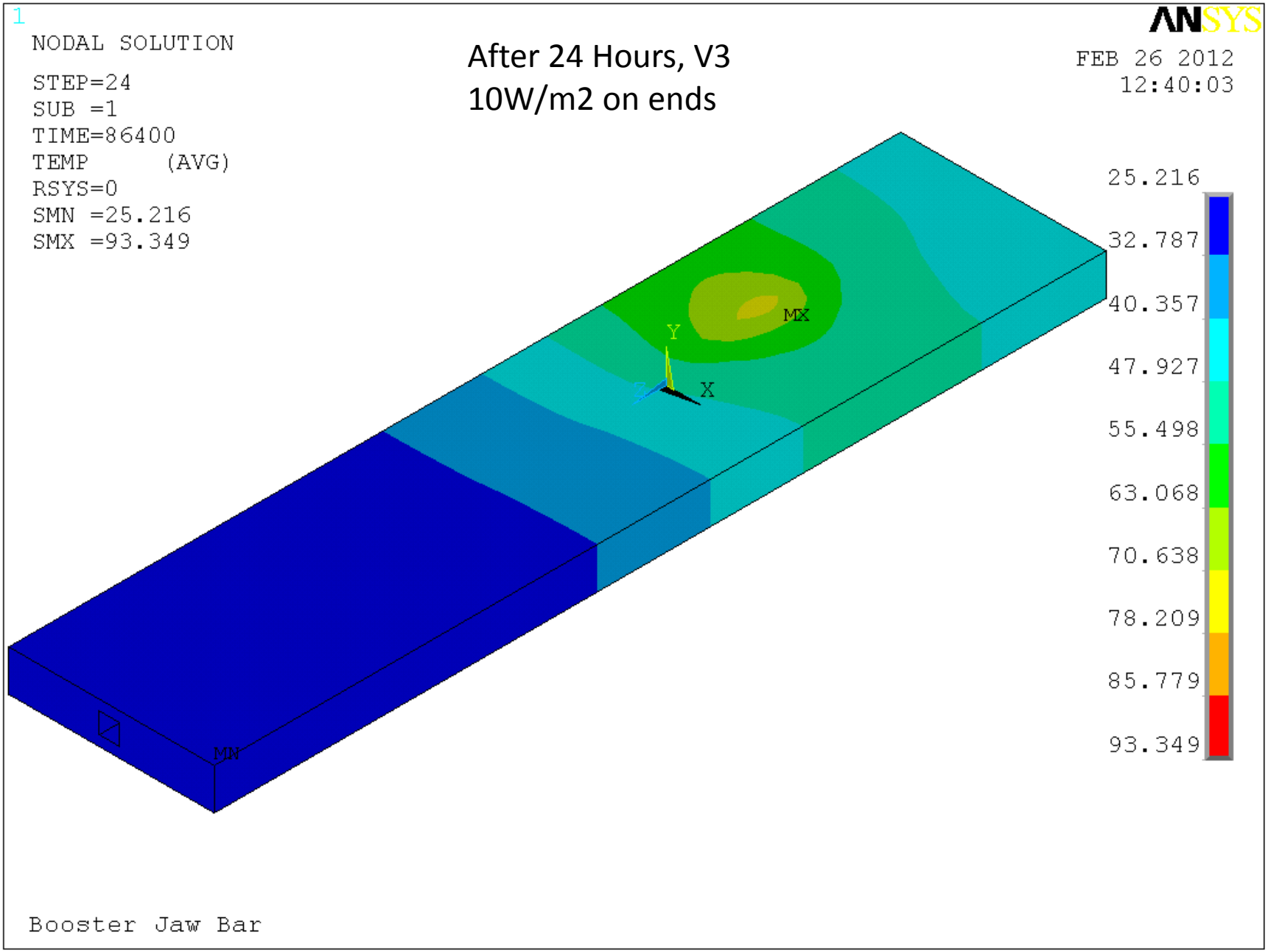
Thermal Model With ED and Conventional Cooling

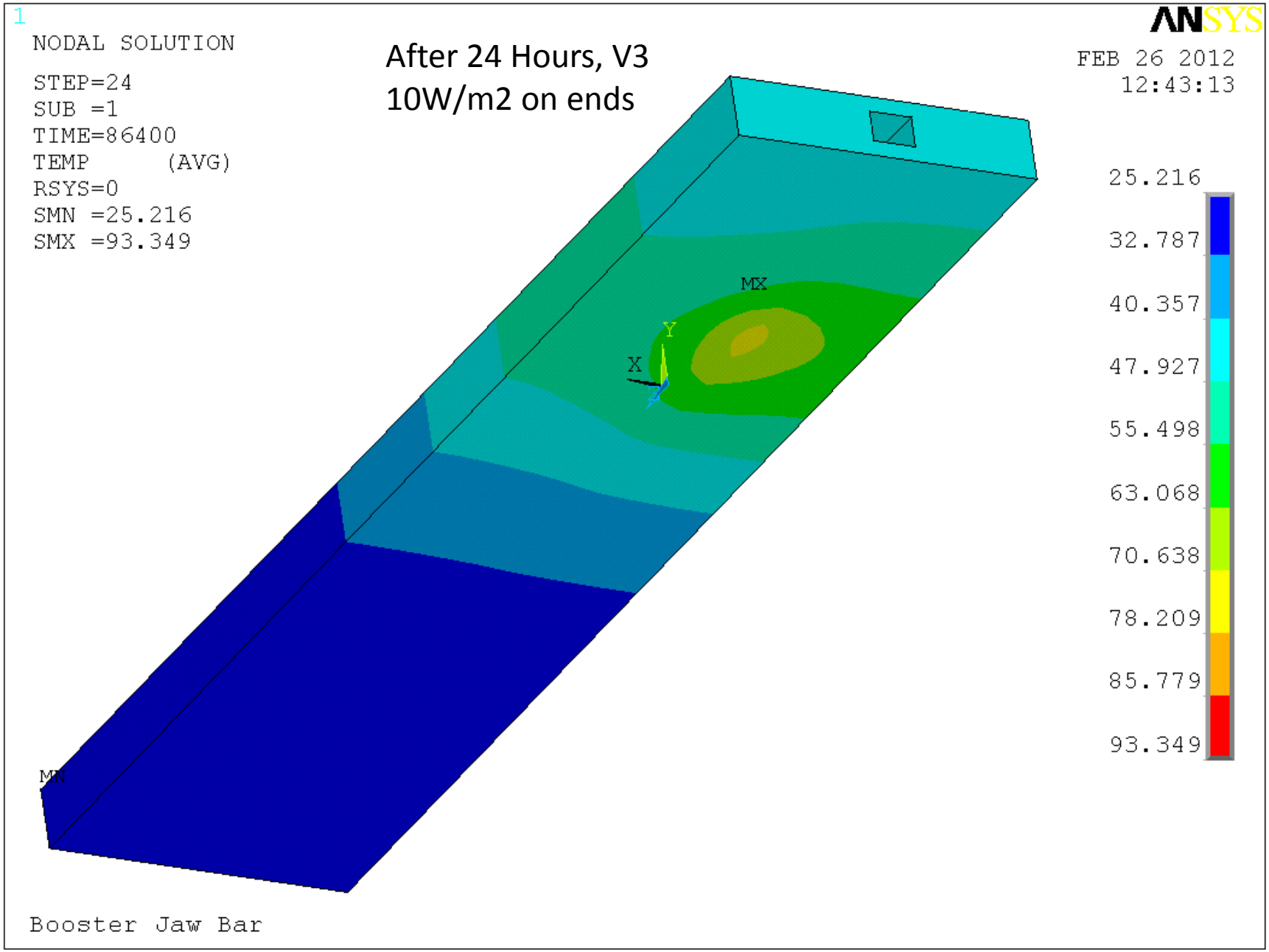
ANSYS

FEB 26 2012
13:35:05



Booster Jaw Bar


1
NODAL SOLUTION
STEP=24
SUB =1
TIME=86400
TEMP (AVG)
RSYS=0
SMN =25.216
SMX =93.349
After 24 Hours, V3
10W/m2 on ends
ANSYS
FEB 26 2012
12:40:03
25.216
32.787
40.357
47.927
55.498
63.068
70.638
78.209
85.779
93.349
MX
MN
Y
X
Booster Jaw Bar


1
NODAL SOLUTION
STEP=24
SUB =1
TIME=86400
TEMP (AVG)
RSYS=0
SMN =25.216
SMX =93.349
After 24 Hours, V3
10W/m2 on ends
ANSYS
FEB 26 2012
12:43:13
25.216
32.787
40.357
47.927
55.498
63.068
70.638
78.209
85.779
93.349
MX
MN
Y
X
Booster Jaw Bar

1

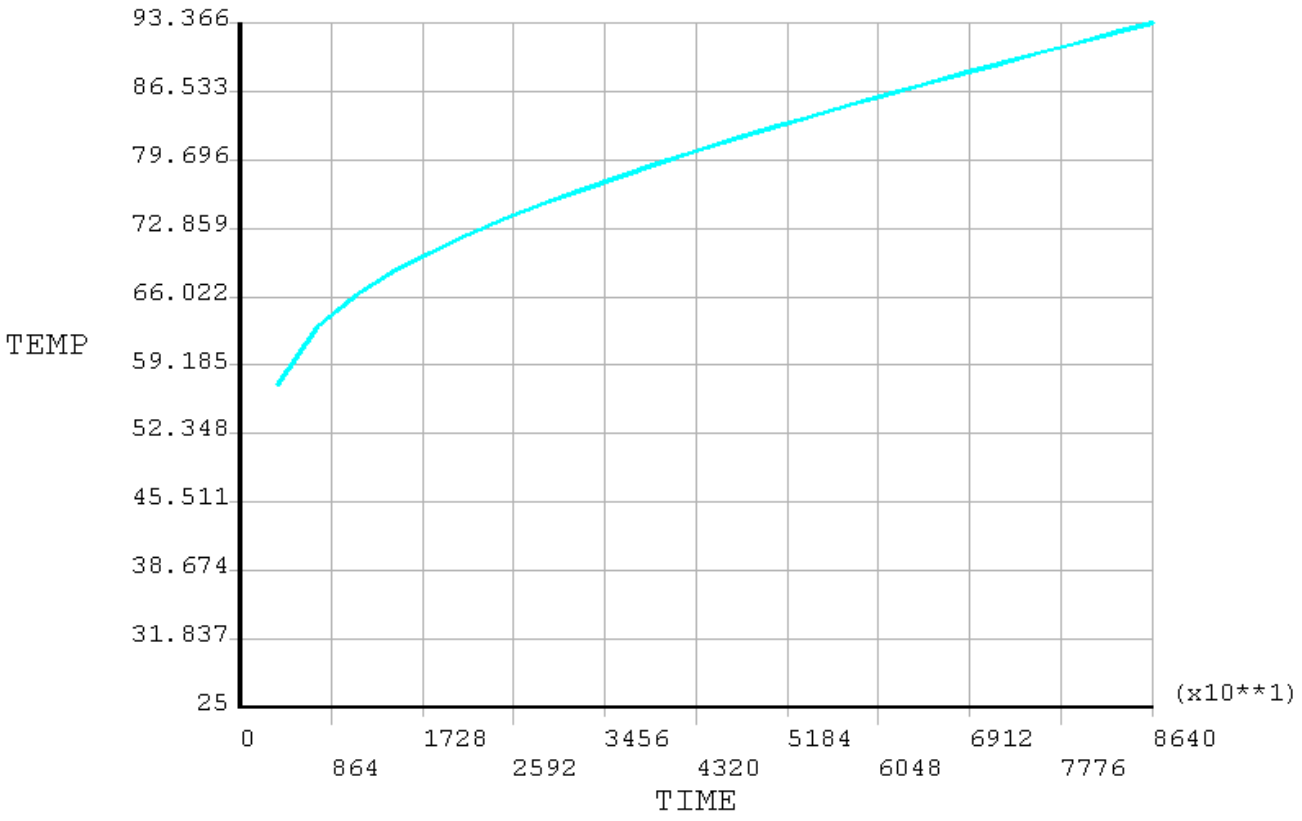
POST26

TEMP

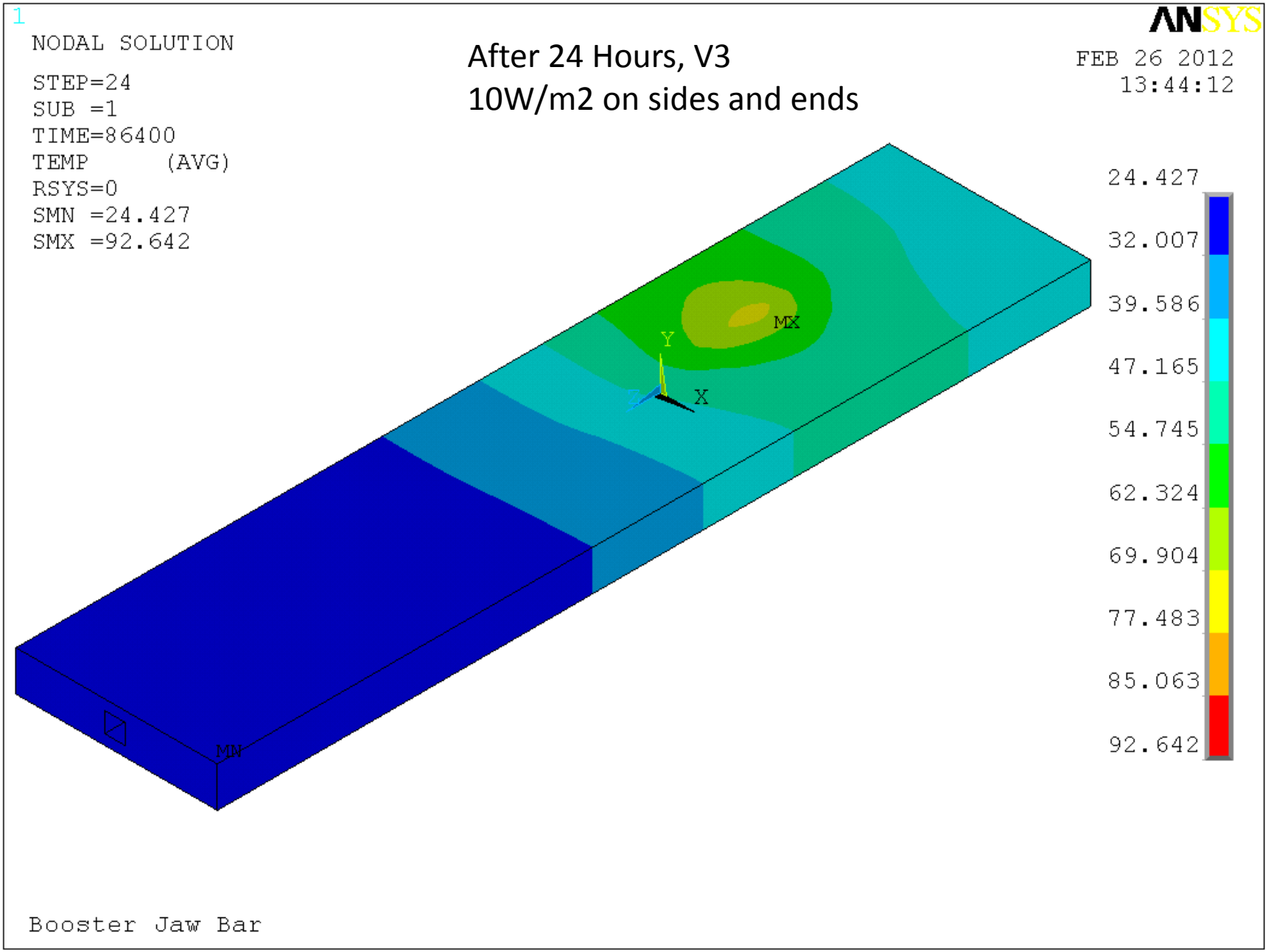
ANSYS

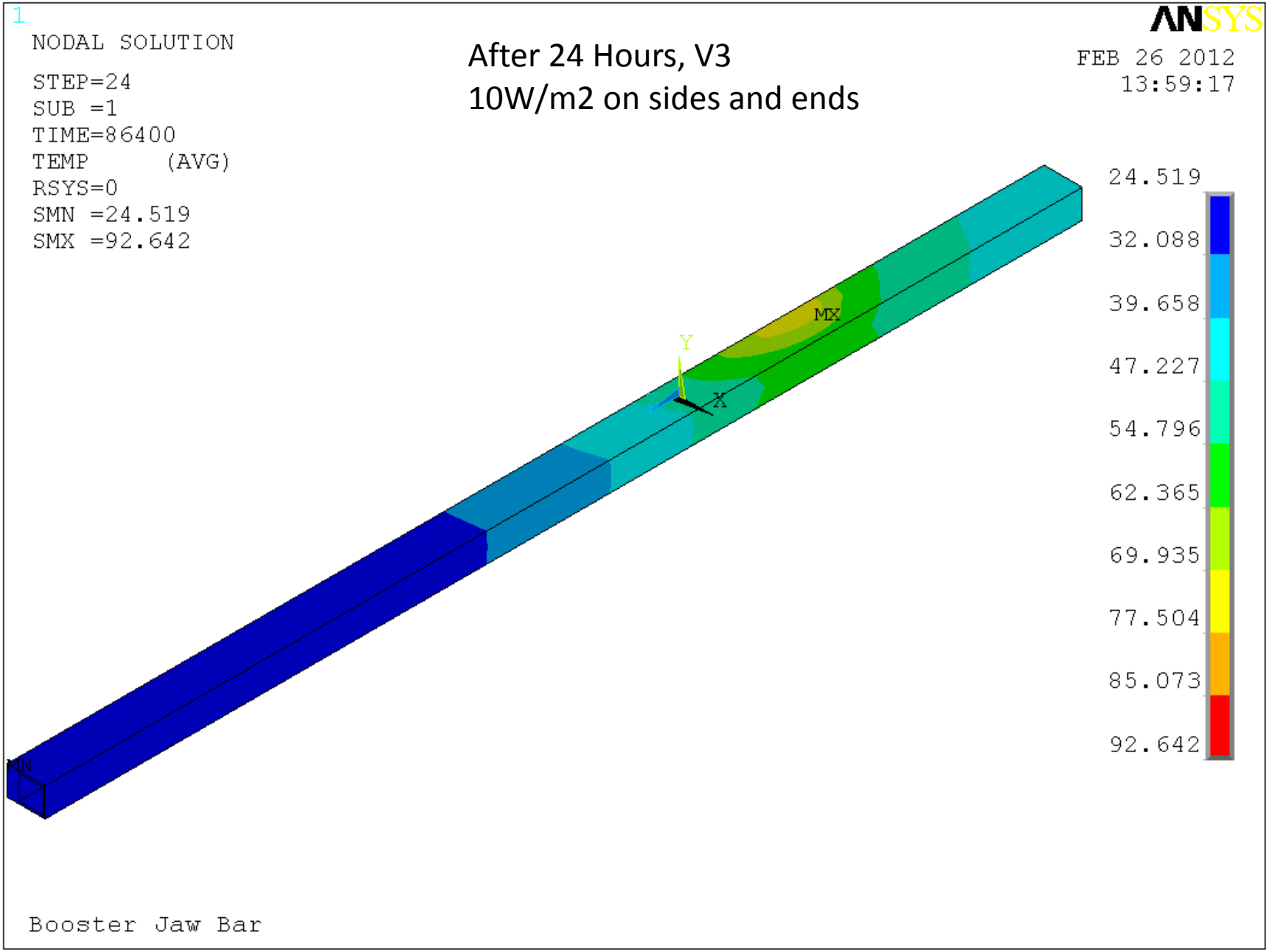
FEB 26 2012
12:38:04

After 24 Hours, V3
10W/m2 on ends



Booster Jaw Bar


1
NODAL SOLUTION
STEP=24
SUB =1
TIME=86400
TEMP (AVG)
RSYS=0
SMN =24.427
SMX =92.642
After 24 Hours, V3
10W/m2 on sides and ends
ANSYS
FEB 26 2012
13:44:12
24.427
32.007
39.586
47.165
54.745
62.324
69.904
77.483
85.063
92.642
MX
MN
Y
X
Booster Jaw Bar


1
NODAL SOLUTION
STEP=24
SUB =1
TIME=86400
TEMP (AVG)
RSYS=0
SMN =24.519
SMX =92.642
After 24 Hours, V3
10W/m2 on sides and ends
ANSYS
FEB 26 2012
13:59:17
24.519
32.088
39.658
47.227
54.796
62.365
69.935
77.504
85.073
92.642
MX
MN
Y
X
Booster Jaw Bar

1

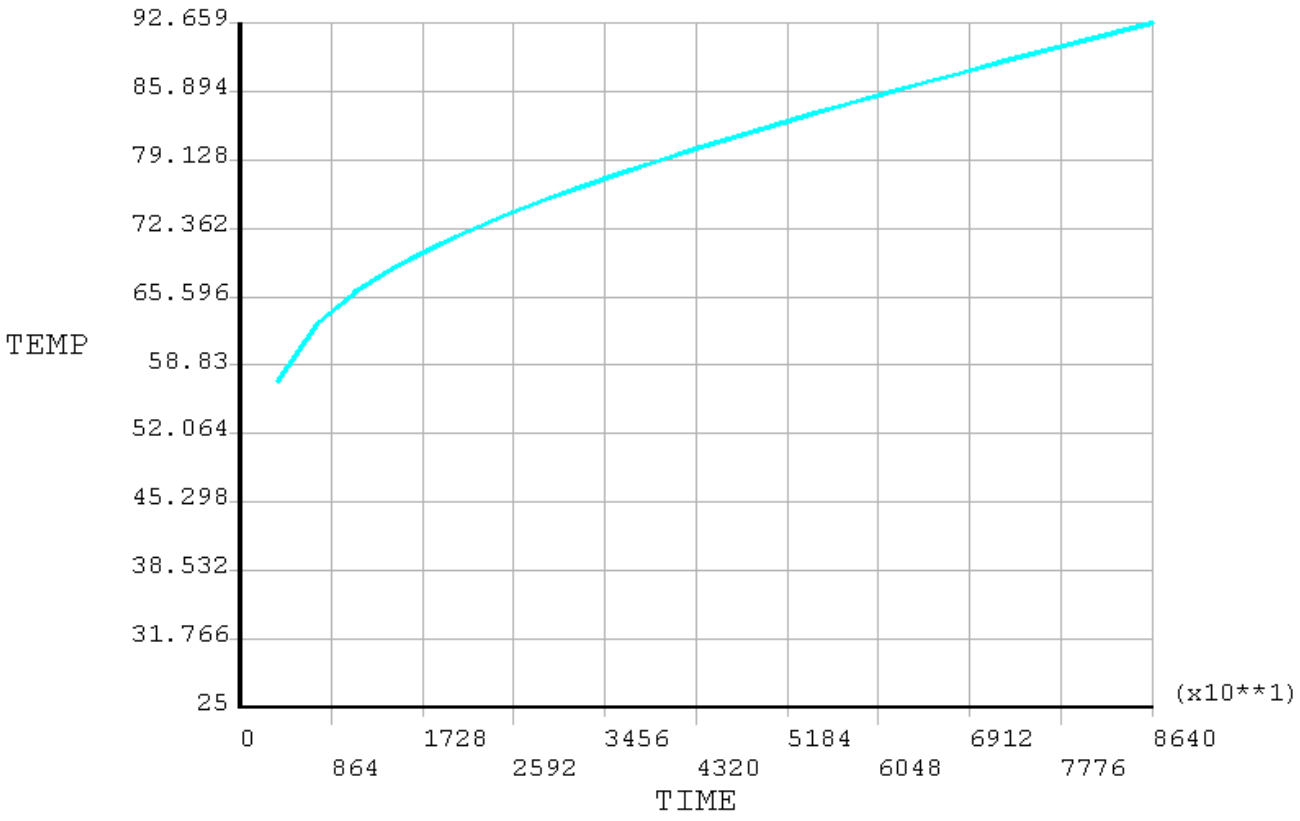
POST26

TEMP

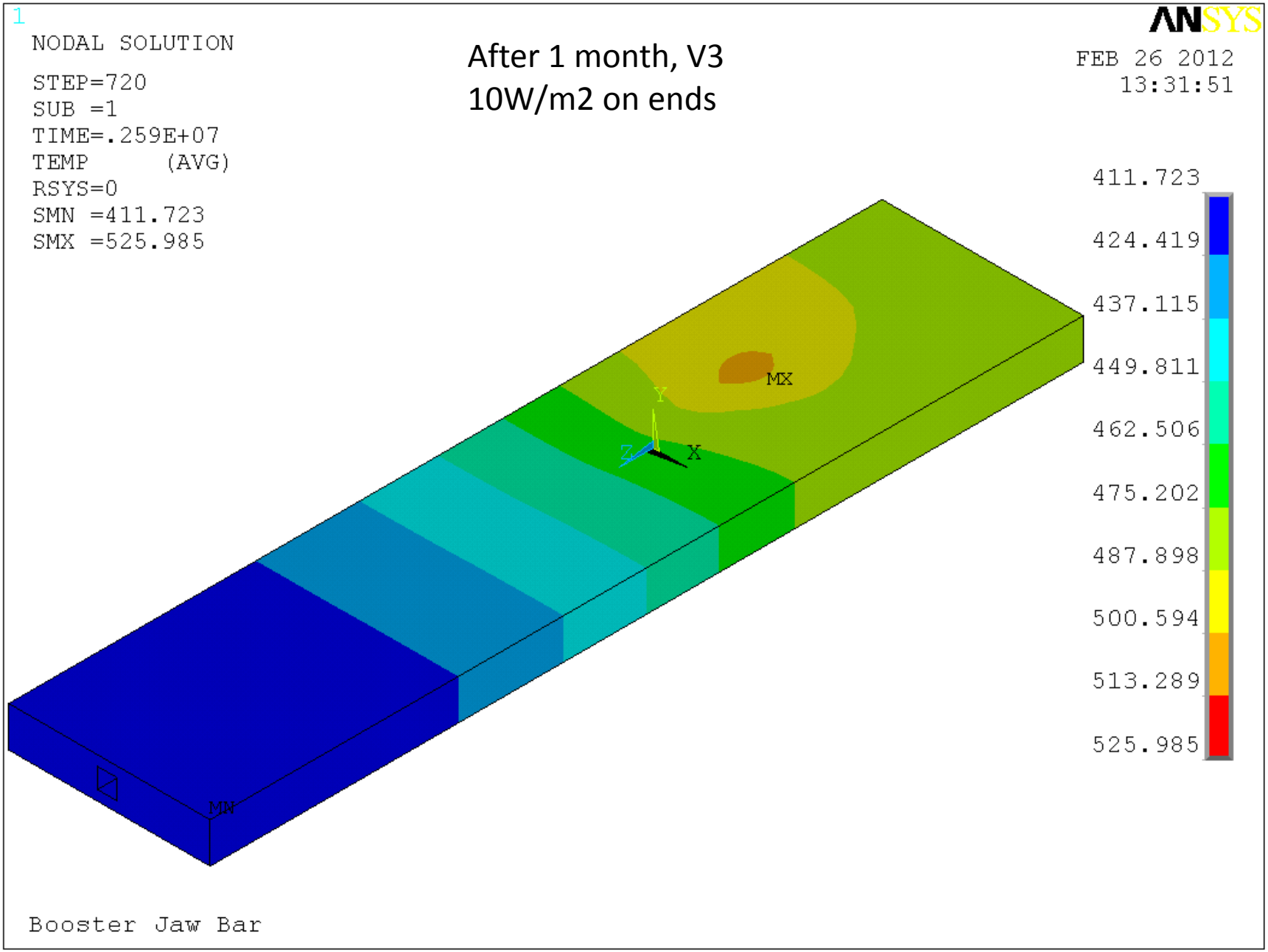
ANSYS

FEB 26 2012
13:41:58

After 24 Hours, V3
10W/m2 on sides and ends



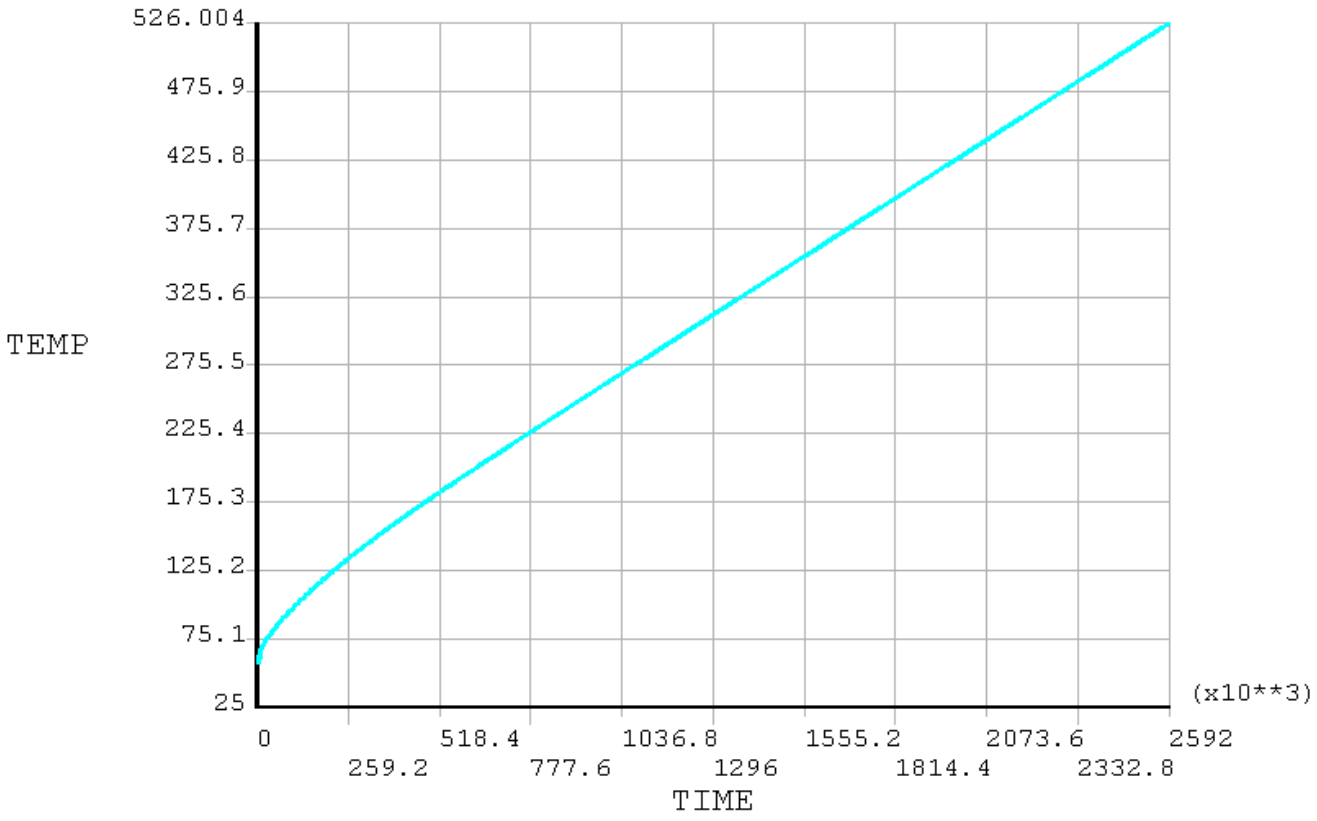
Booster Jaw Bar


1
NODAL SOLUTION
STEP=720
SUB =1
TIME=.259E+07
TEMP (AVG)
RSYS=0
SMN =411.723
SMX =525.985
After 1 month, V3
10W/m2 on ends
ANSYS
FEB 26 2012
13:31:51
411.723
424.419
437.115
449.811
462.506
475.202
487.898
500.594
513.289
525.985
MX
MN
Y
Z
X
Booster Jaw Bar

1
POST26
TEMP

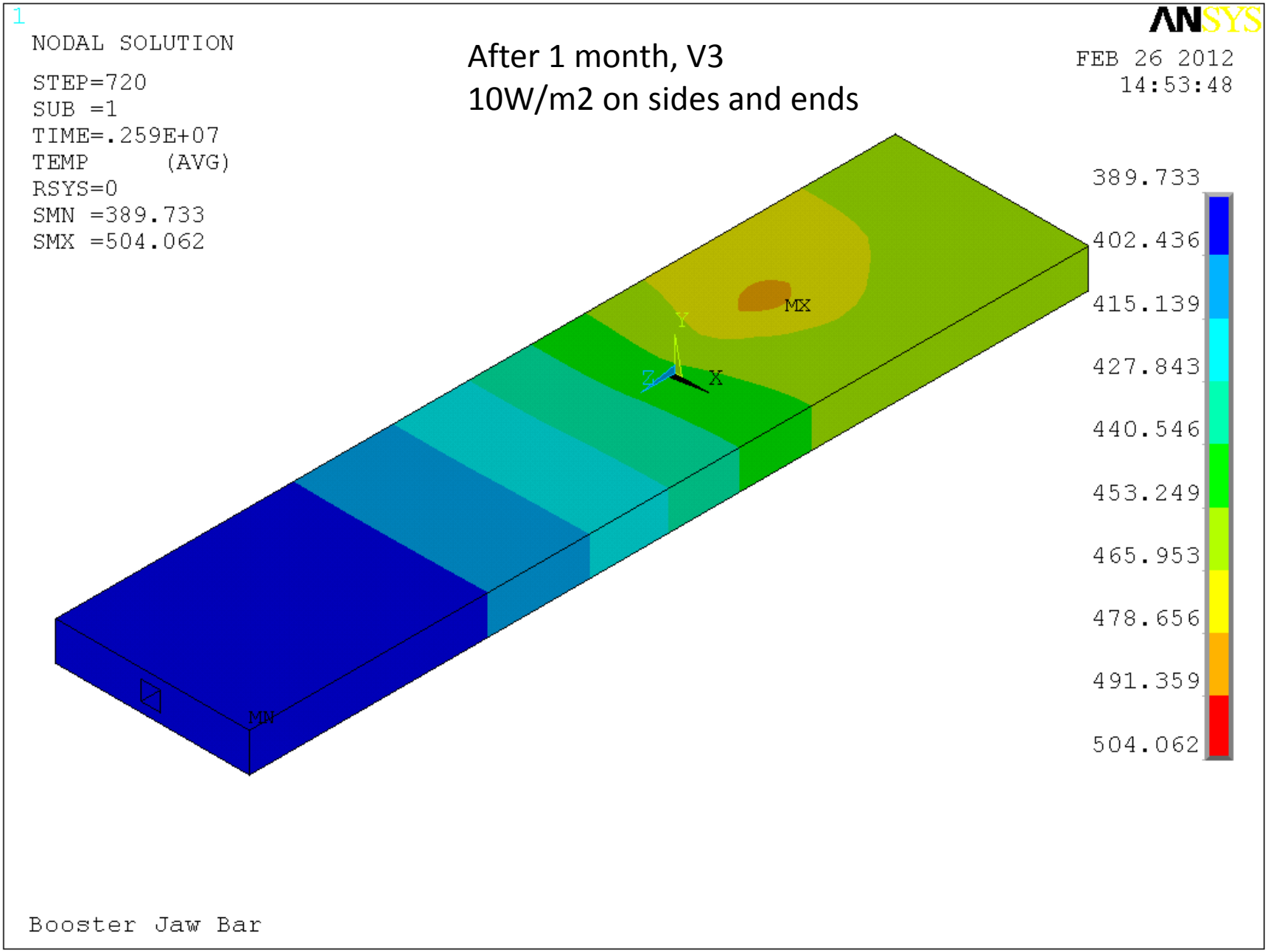
ANSYS
FEB 26 2012
13:30:17

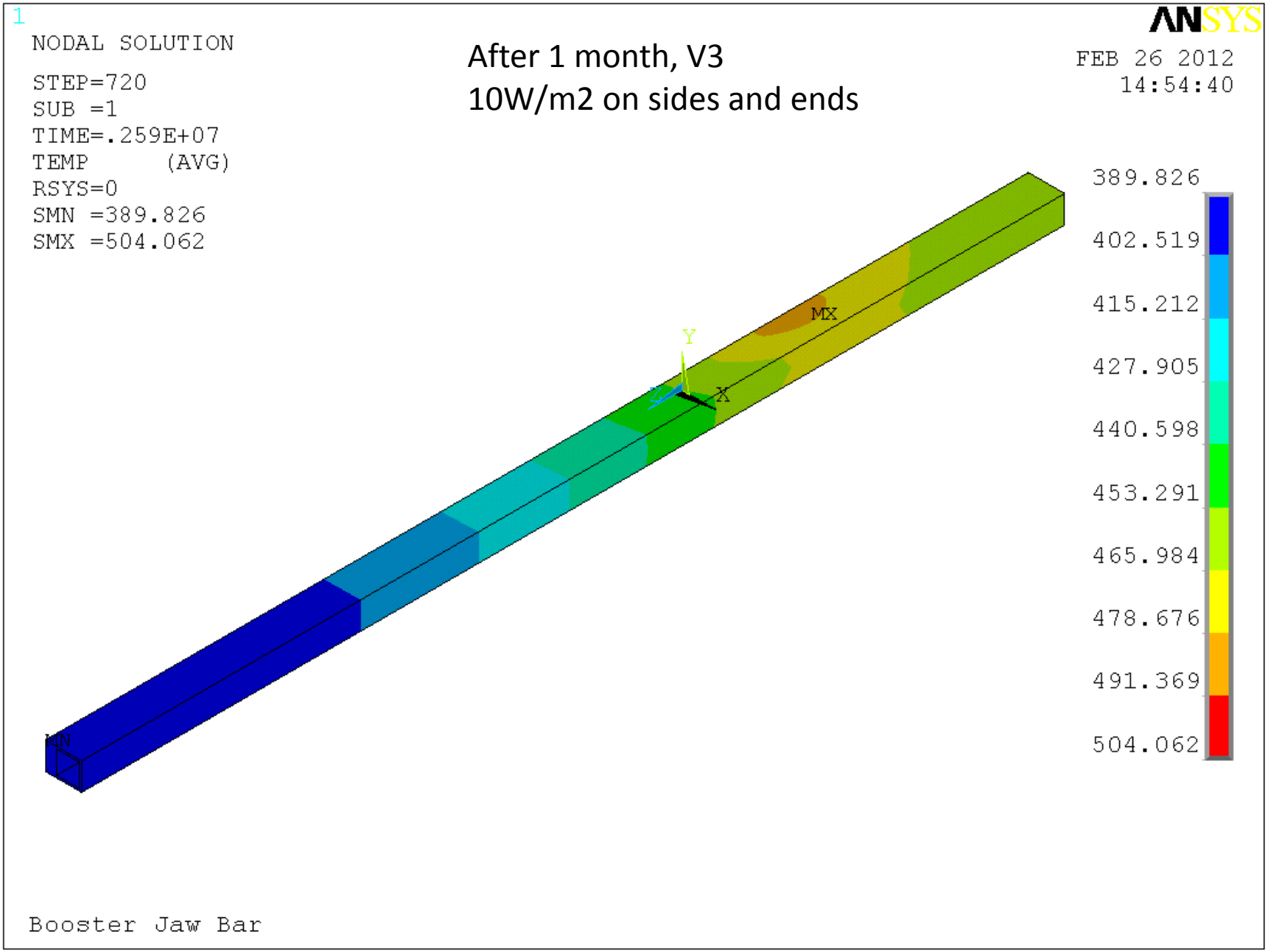
After 1 month, V3
10W/m2 on ends



Booster Jaw Bar

1hour running time


1
NODAL SOLUTION
STEP=720
SUB =1
TIME=.259E+07
TEMP (AVG)
RSYS=0
SMN =389.733
SMX =504.062
After 1 month, V3
10W/m2 on sides and ends
ANSYS
FEB 26 2012
14:53:48
389.733
402.436
415.139
427.843
440.546
453.249
465.953
478.656
491.359
504.062
MX
MN
Y
Z
X
Booster Jaw Bar


1
NODAL SOLUTION
STEP=720
SUB =1
TIME=.259E+07
TEMP (AVG)
RSYS=0
SMN =389.826
SMX =504.062
After 1 month, V3
10W/m2 on sides and ends
ANSYS
FEB 26 2012
14:54:40
389.826
402.519
415.212
427.905
440.598
453.291
465.984
478.676
491.369
504.062
MX
MN
Y
Z
X
Booster Jaw Bar

1

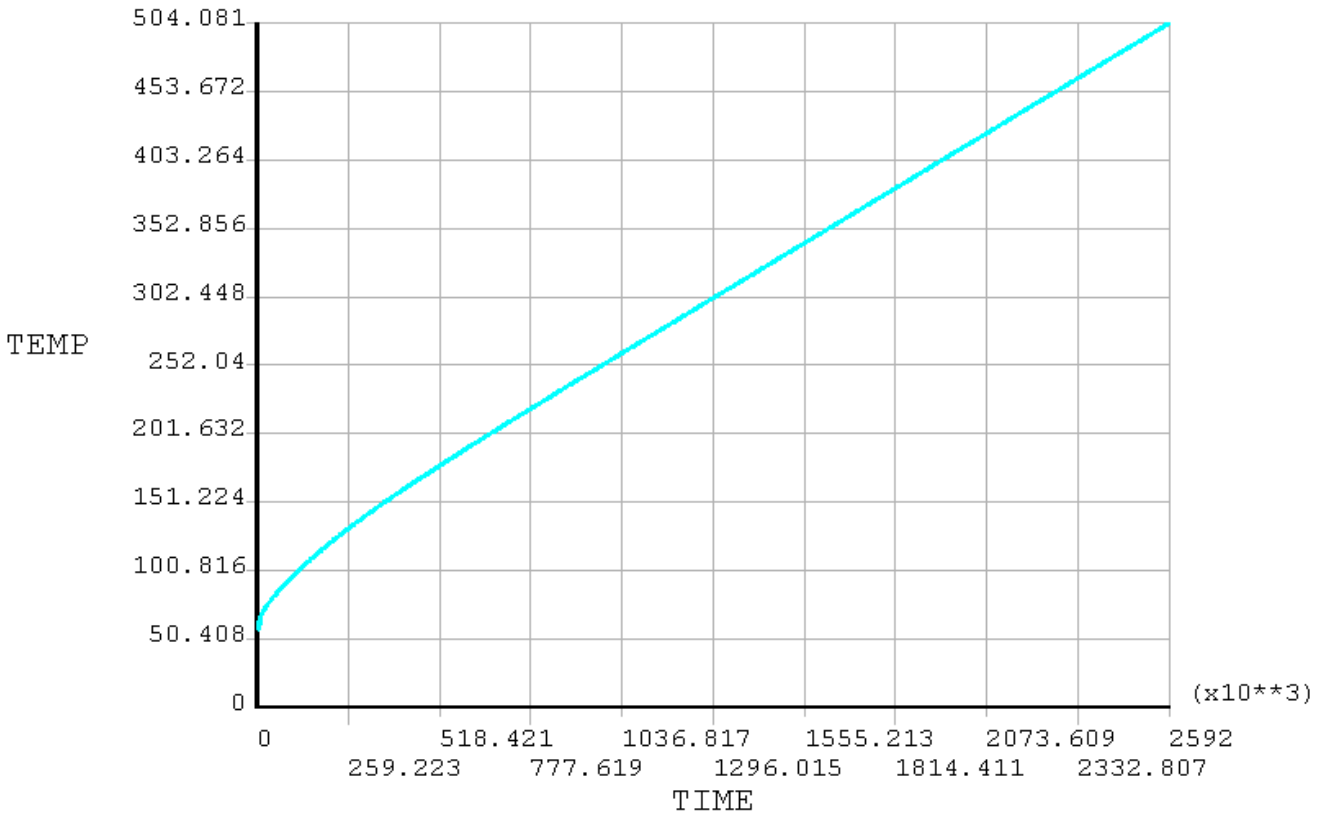
POST26

TEMP

ANSYS

FEB 26 2012
14:52:33

After 1 month, V3
10W/m2 on sides and ends

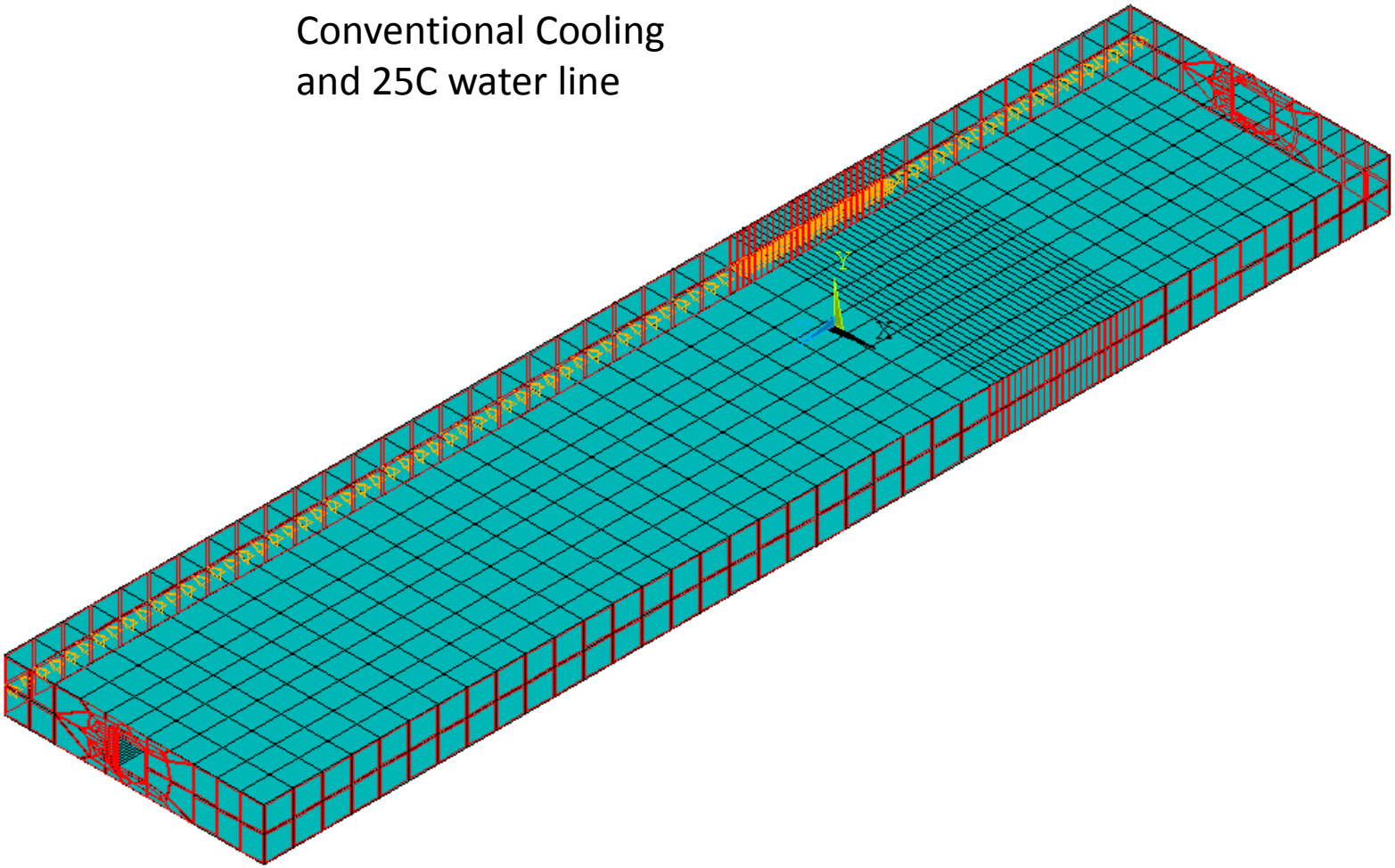


Booster Jaw Bar

1

ANSYS

Thermal Model
With ED,
Conventional Cooling
and 25C water line



Booster Jaw Bar

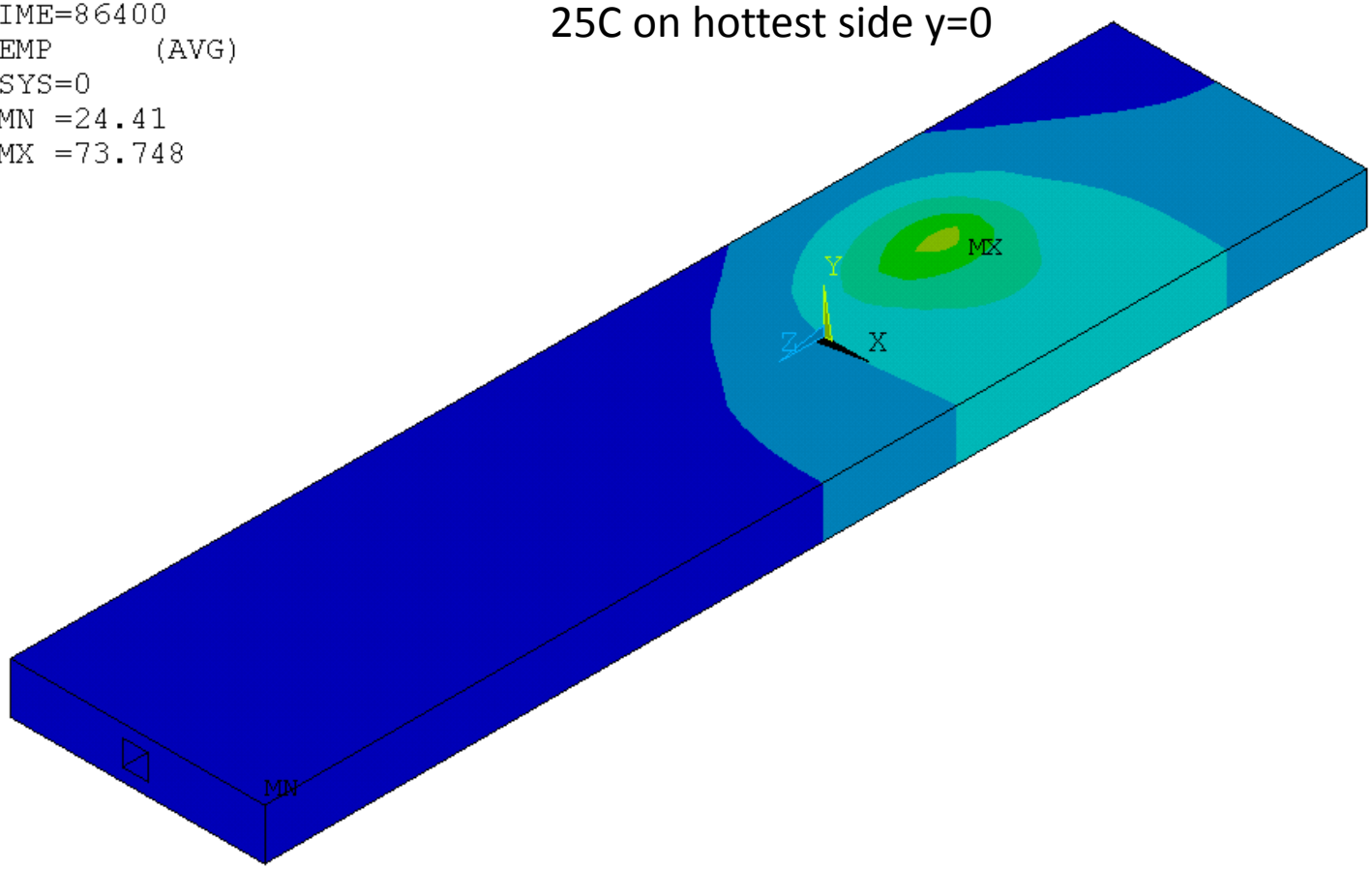
1

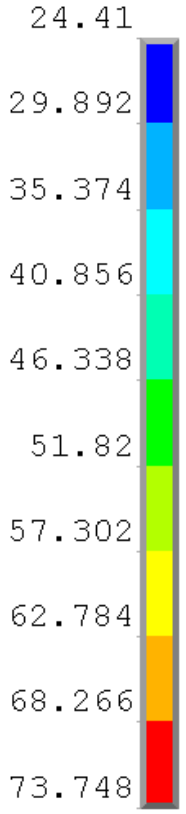
NODAL SOLUTION

STEP=24
SUB =1
TIME=86400
TEMP (AVG)
RSYS=0
SMN =24.41
SMX =73.748

After 24 Hours, V3
10W/m2 on sides and ends
25C on hottest side y=0

ANSYS 12.0.1
FEB 27 2012
08:44:26





Booster Jaw Bar

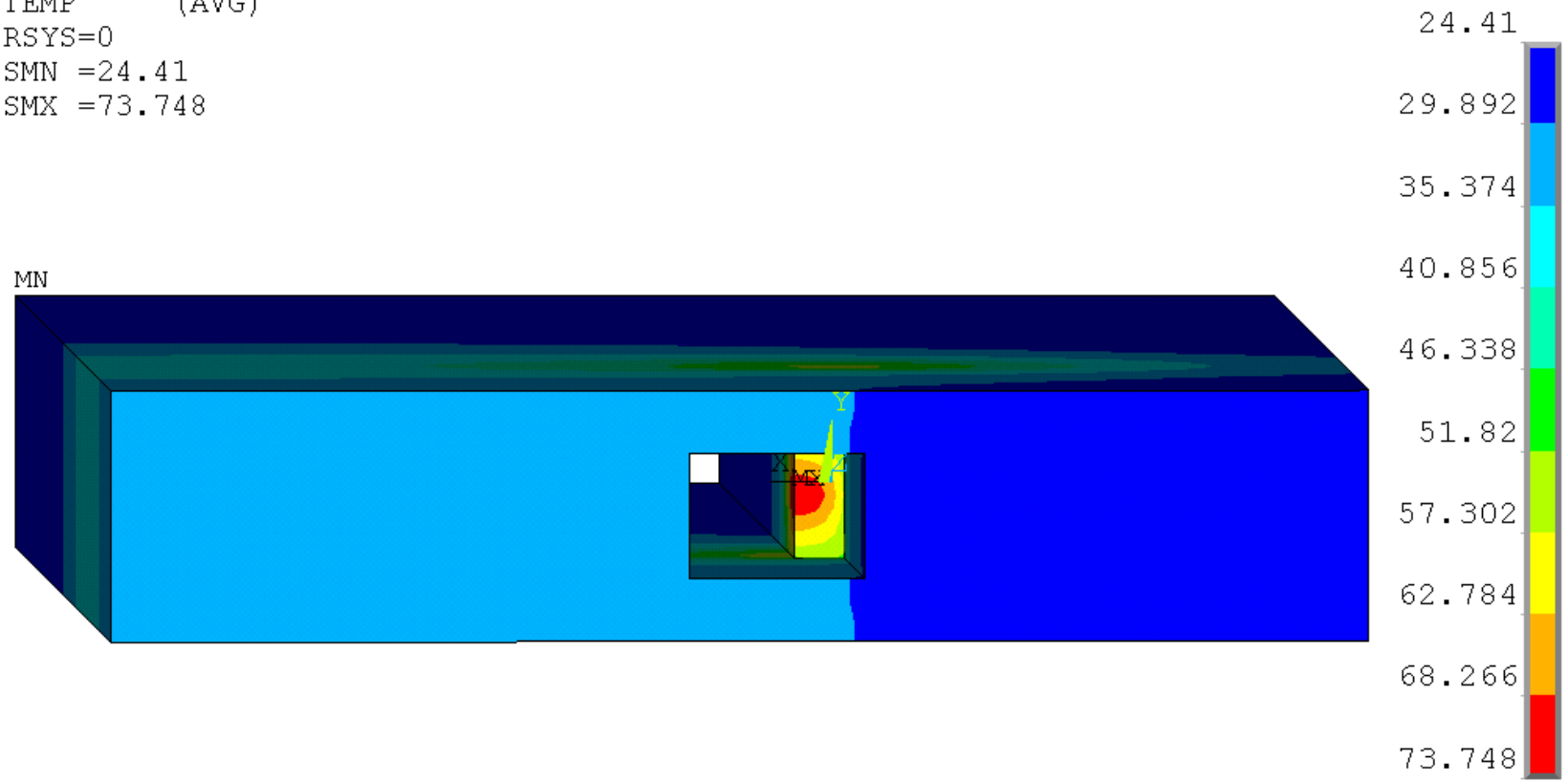
1

NODAL SOLUTION

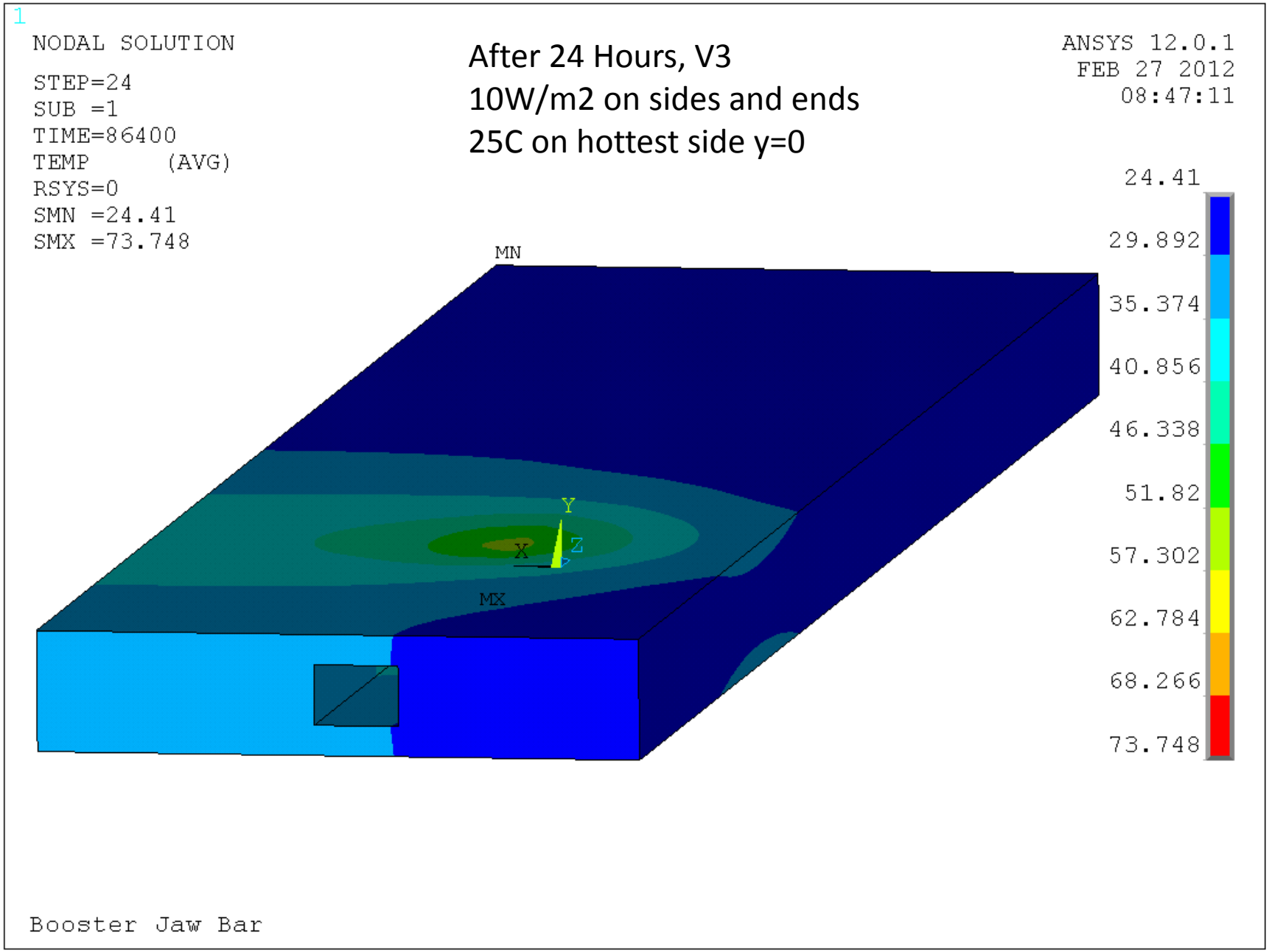
STEP=24
SUB =1
TIME=86400
TEMP (AVG)
RSYS=0
SMN =24.41
SMX =73.748

After 24 Hours, V3
10W/m2 on sides and ends
25C on hottest side y=0

ANSYS 12.0.1
FEB 27 2012
08:45:31



Booster Jaw Bar


1
NODAL SOLUTION
STEP=24
SUB =1
TIME=86400
TEMP (AVG)
RSYS=0
SMN =24.41
SMX =73.748
After 24 Hours, V3
10W/m2 on sides and ends
25C on hottest side y=0
ANSYS 12.0.1
FEB 27 2012
08:47:11
24.41
29.892
35.374
40.856
46.338
51.82
57.302
62.784
68.266
73.748
MN
MX
Y
X
Z
Booster Jaw Bar

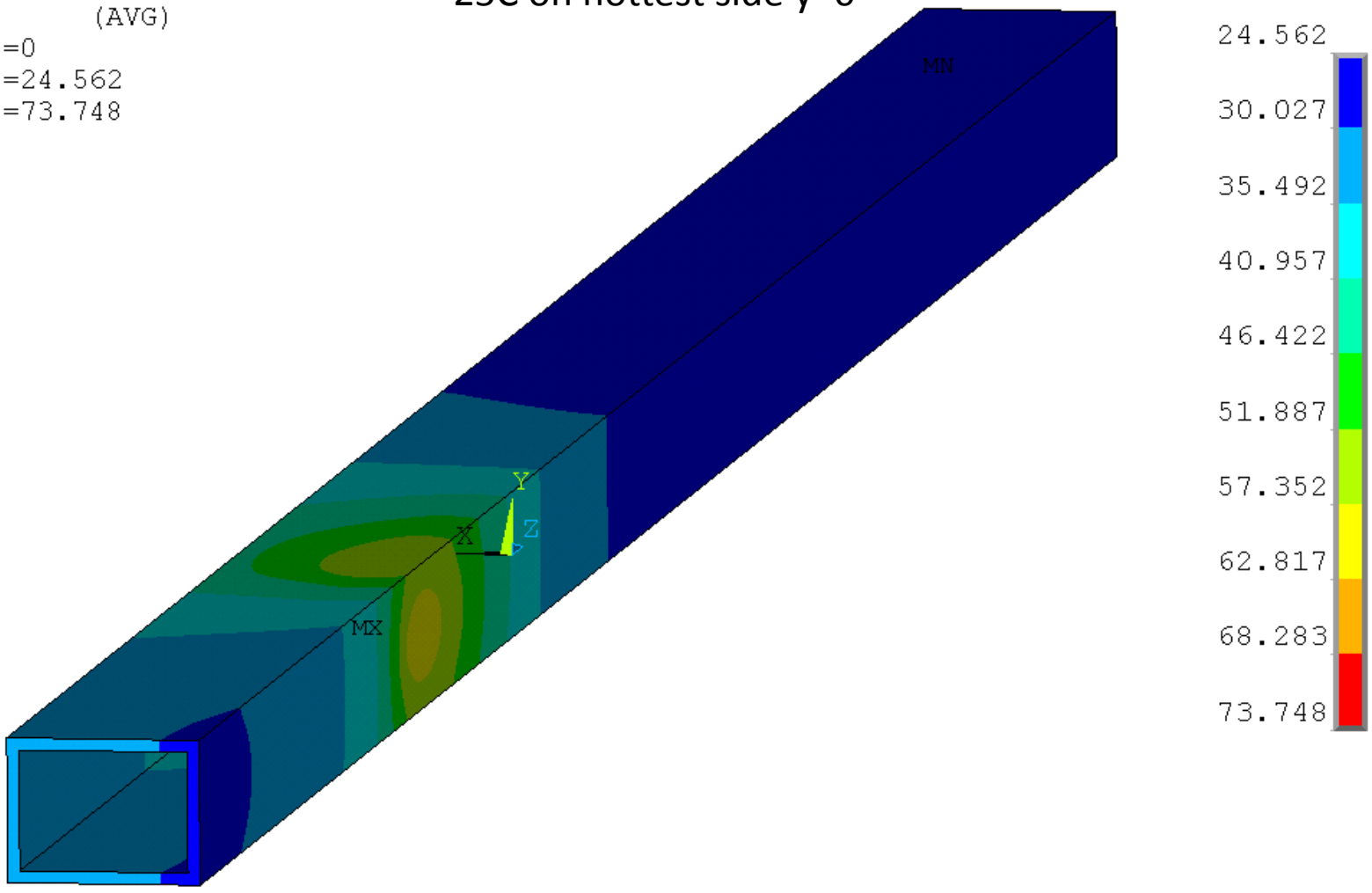
1

NODAL SOLUTION

STEP=24
SUB =1
TIME=86400
TEMP (AVG)
RSYS=0
SMN =24.562
SMX =73.748

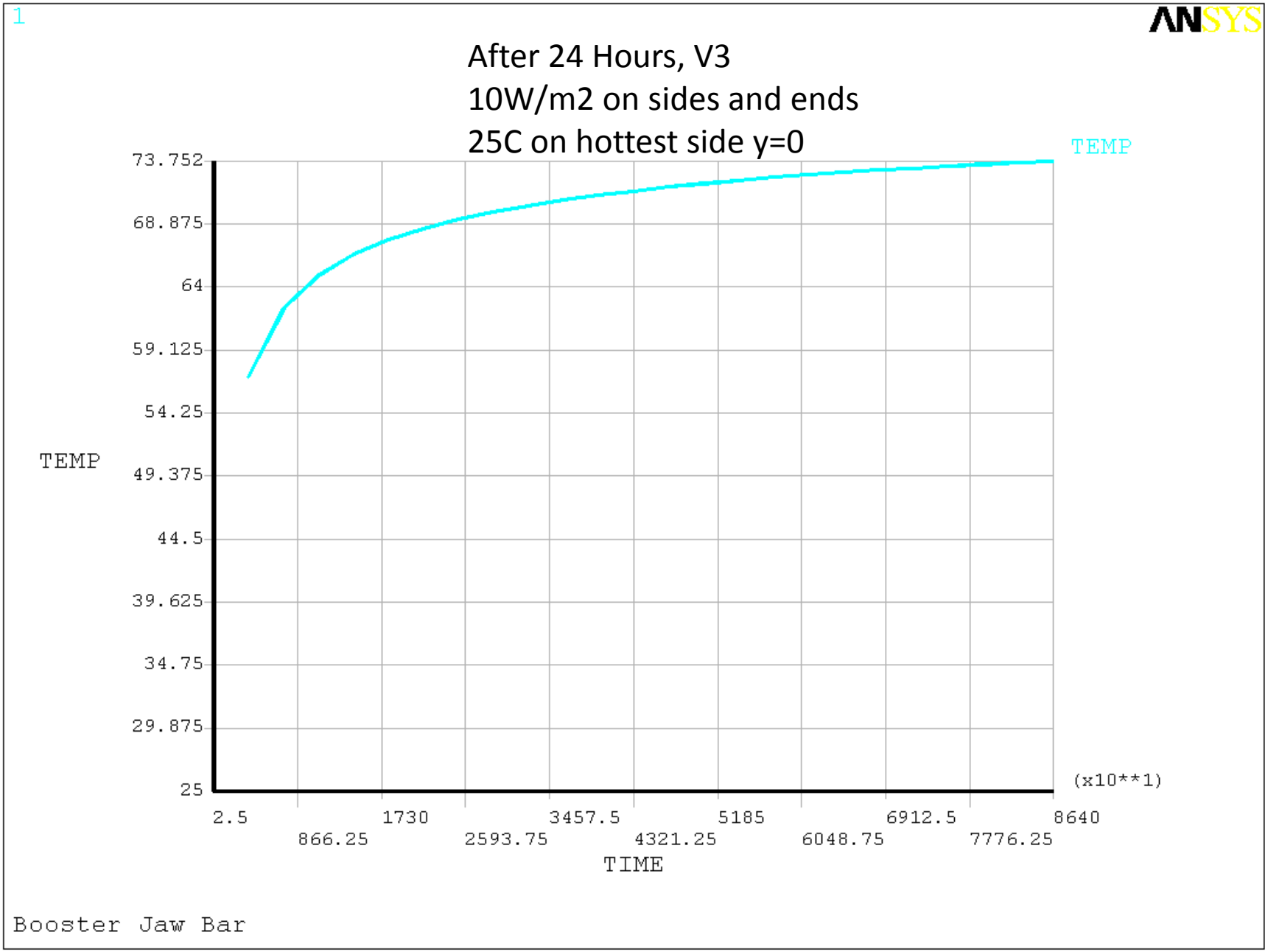
After 24 Hours, V3
10W/m2 on sides and ends
25C on hottest side y=0

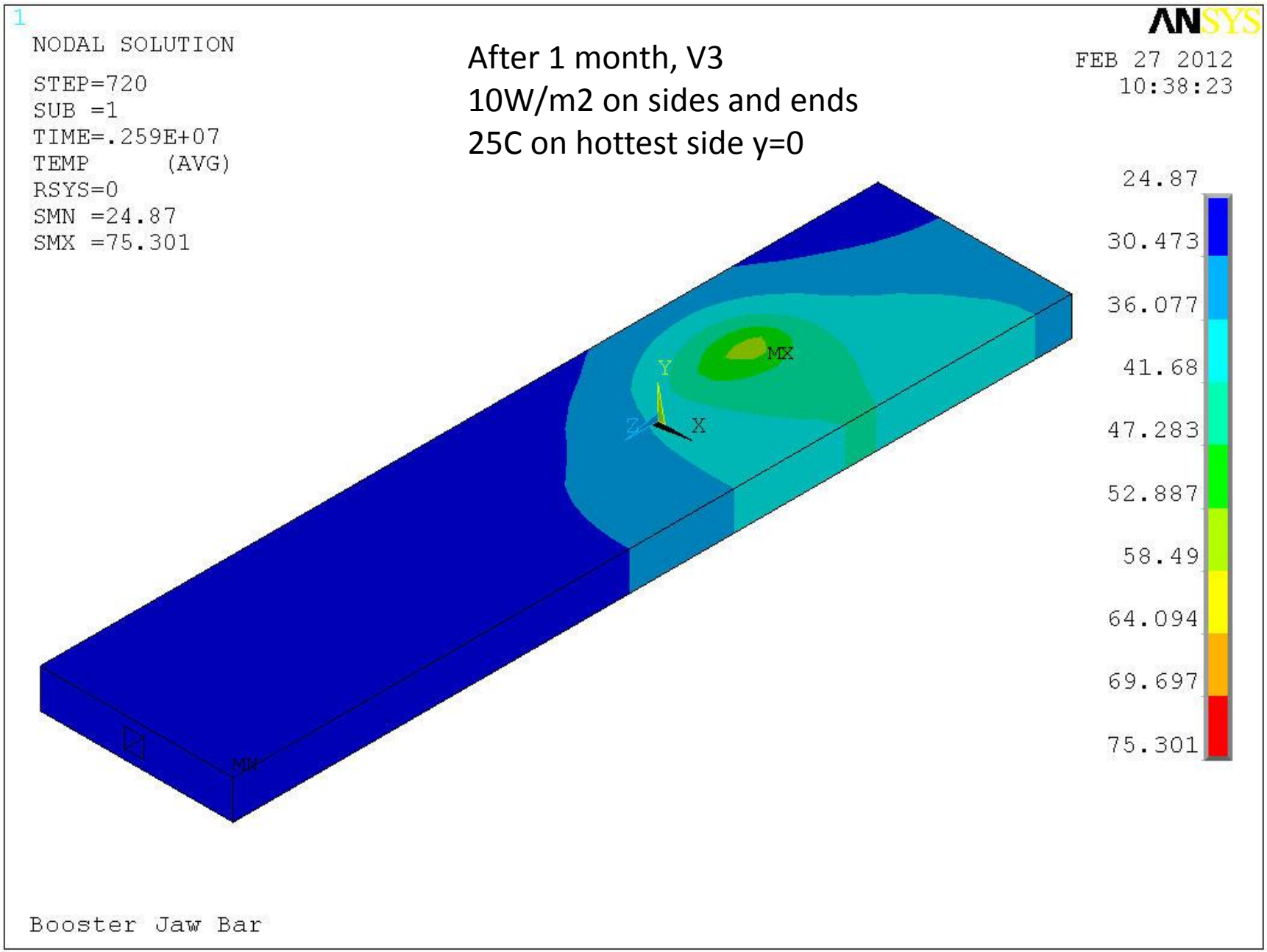
ANSYS 12.0.1
FEB 27 2012
08:47:52

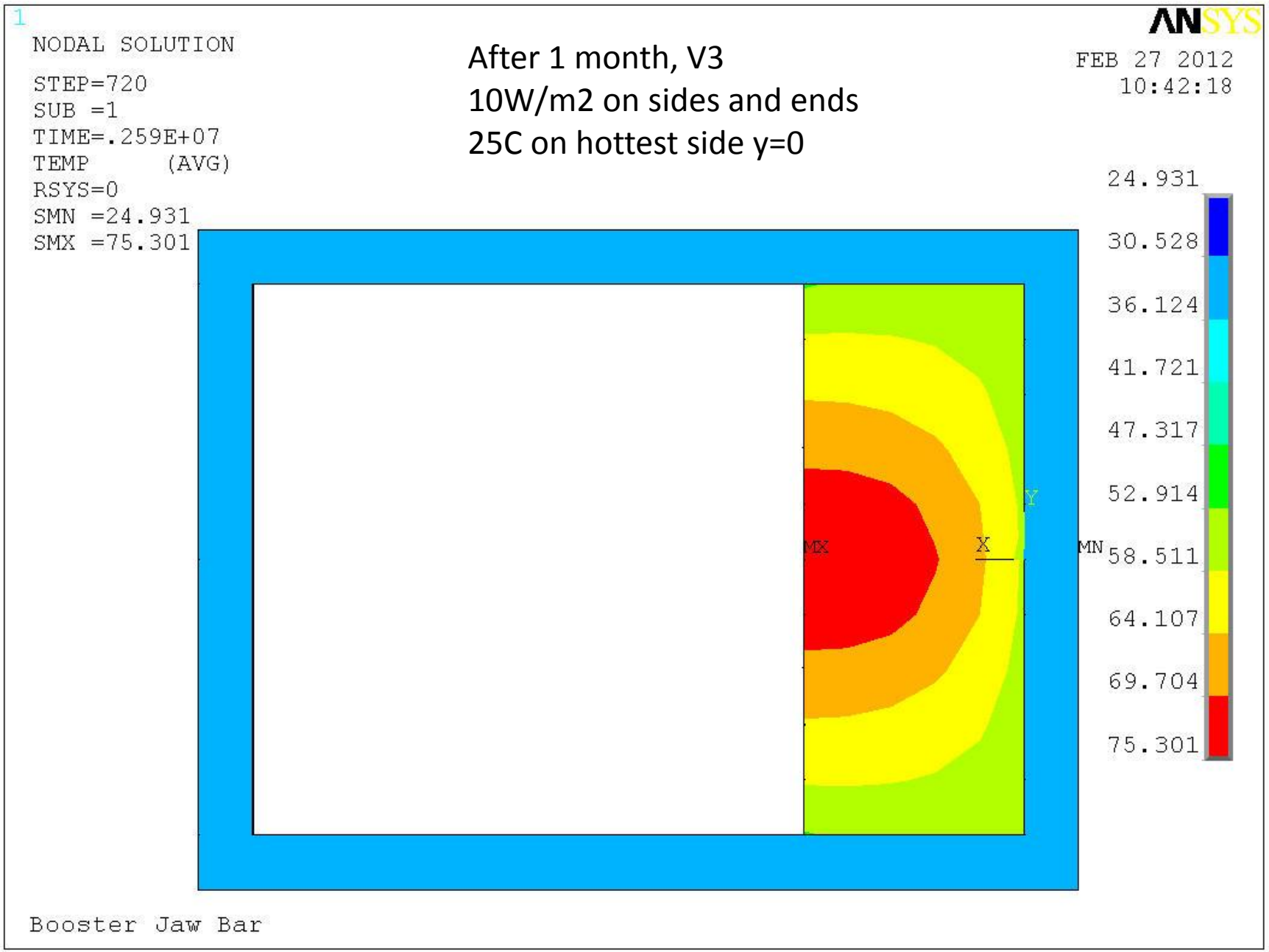


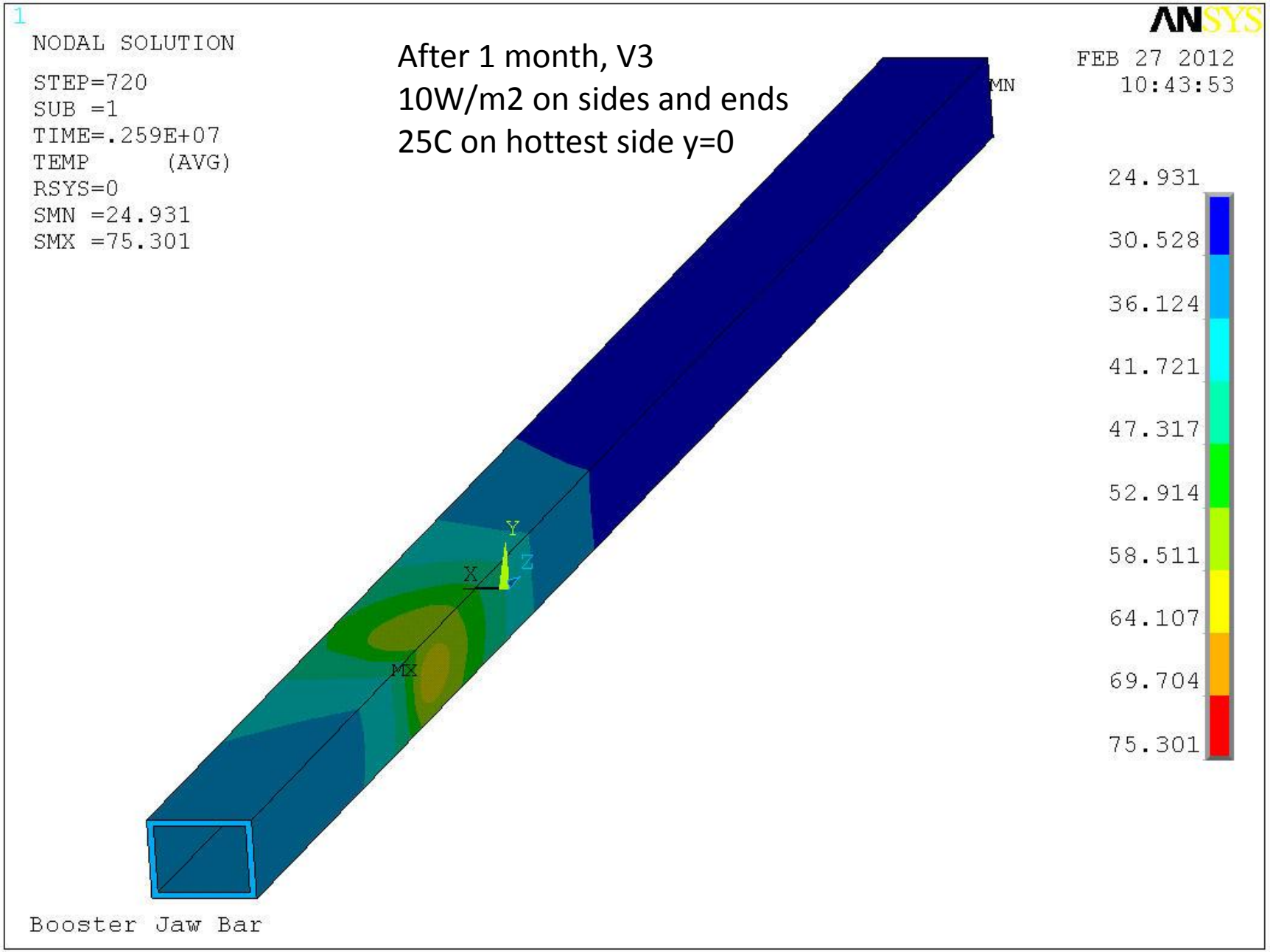
24.562
30.027
35.492
40.957
46.422
51.887
57.352
62.817
68.283
73.748

Booster Jaw Bar


1
ANSYS
After 24 Hours, V3
10W/m2 on sides and ends
25C on hottest side y=0
TEMP
73.752
68.875
64
59.125
54.25
TEMP
49.375
44.5
39.625
34.75
29.875
25
(x10**1)
2.5
866.25
1730
2593.75
3457.5
4321.25
5185
6048.75
6912.5
7776.25
8640
TIME
Booster Jaw Bar


1
NODAL SOLUTION
STEP=720
SUB =1
TIME=.259E+07
TEMP (AVG)
RSYS=0
SMN =24.87
SMX =75.301
After 1 month, V3
10W/m2 on sides and ends
25C on hottest side y=0
ANSYS
FEB 27 2012
10:38:23
24.87
30.473
36.077
41.68
47.283
52.887
58.49
64.094
69.697
75.301
MX
MN
Y
Z
X
Booster Jaw Bar


1
NODAL SOLUTION
STEP=720
SUB =1
TIME=.259E+07
TEMP (AVG)
RSYS=0
SMN =24.931
SMX =75.301
After 1 month, V3
10W/m2 on sides and ends
25C on hottest side y=0
ANSYS
FEB 27 2012
10:42:18
24.931
30.528
36.124
41.721
47.317
52.914
58.511
64.107
69.704
75.301
MX
MN
Y
X
Booster Jaw Bar


1
NODAL SOLUTION
STEP=720
SUB =1
TIME=.259E+07
TEMP (AVG)
RSYS=0
SMN =24.931
SMX =75.301
After 1 month, V3
10W/m2 on sides and ends
25C on hottest side y=0
ANSYS
FEB 27 2012
10:43:53
MN
24.931
30.528
36.124
41.721
47.317
52.914
58.511
64.107
69.704
75.301
Y
Z
X
MX
Booster Jaw Bar

1

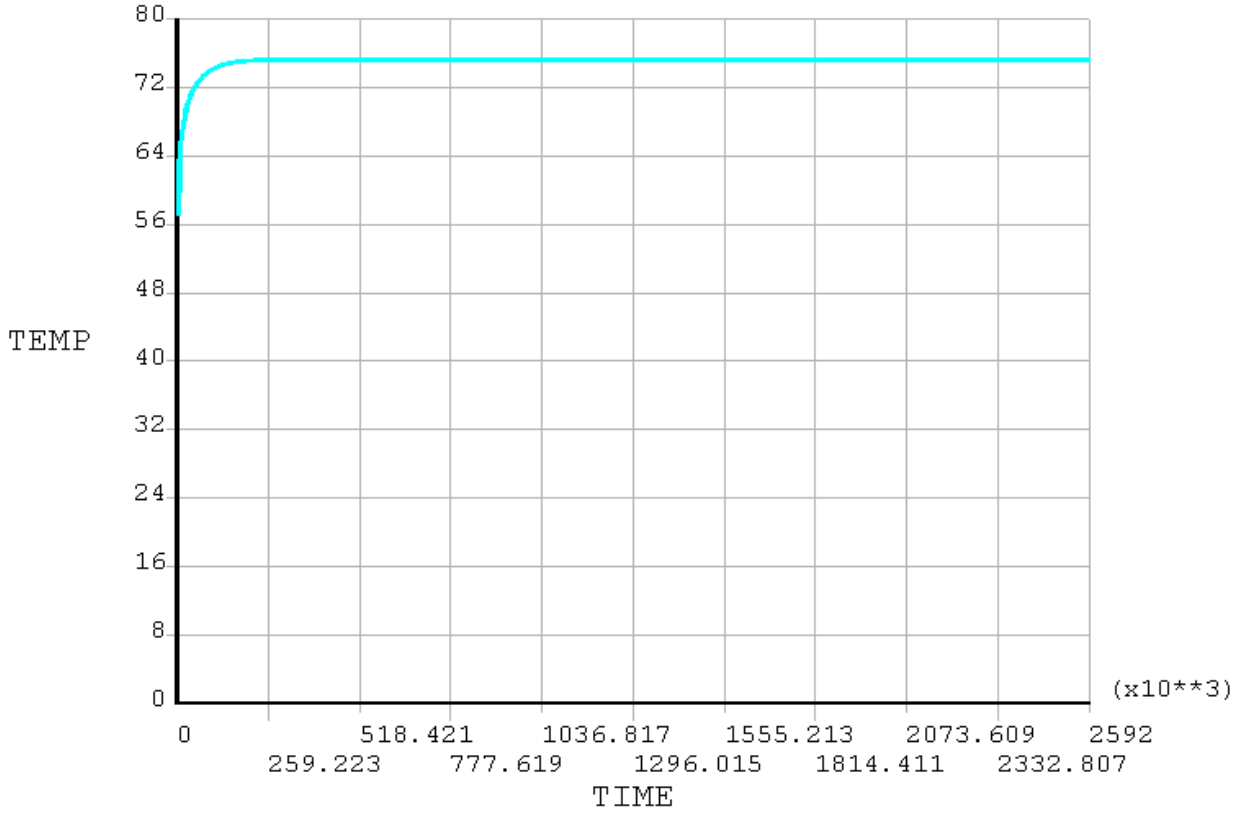
POST26

TEMP

ANSYS

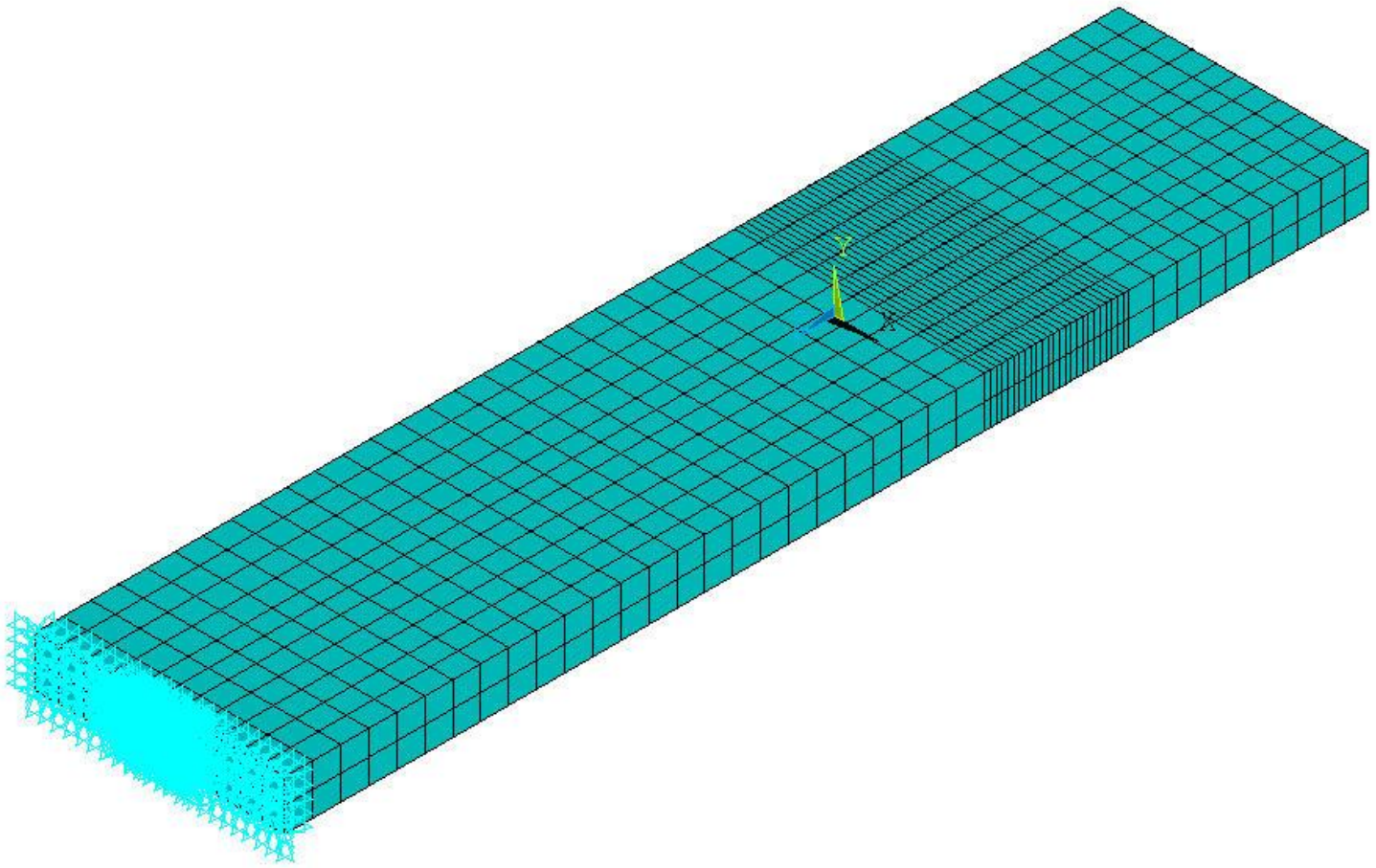
FEB 27 2012
10:37:37

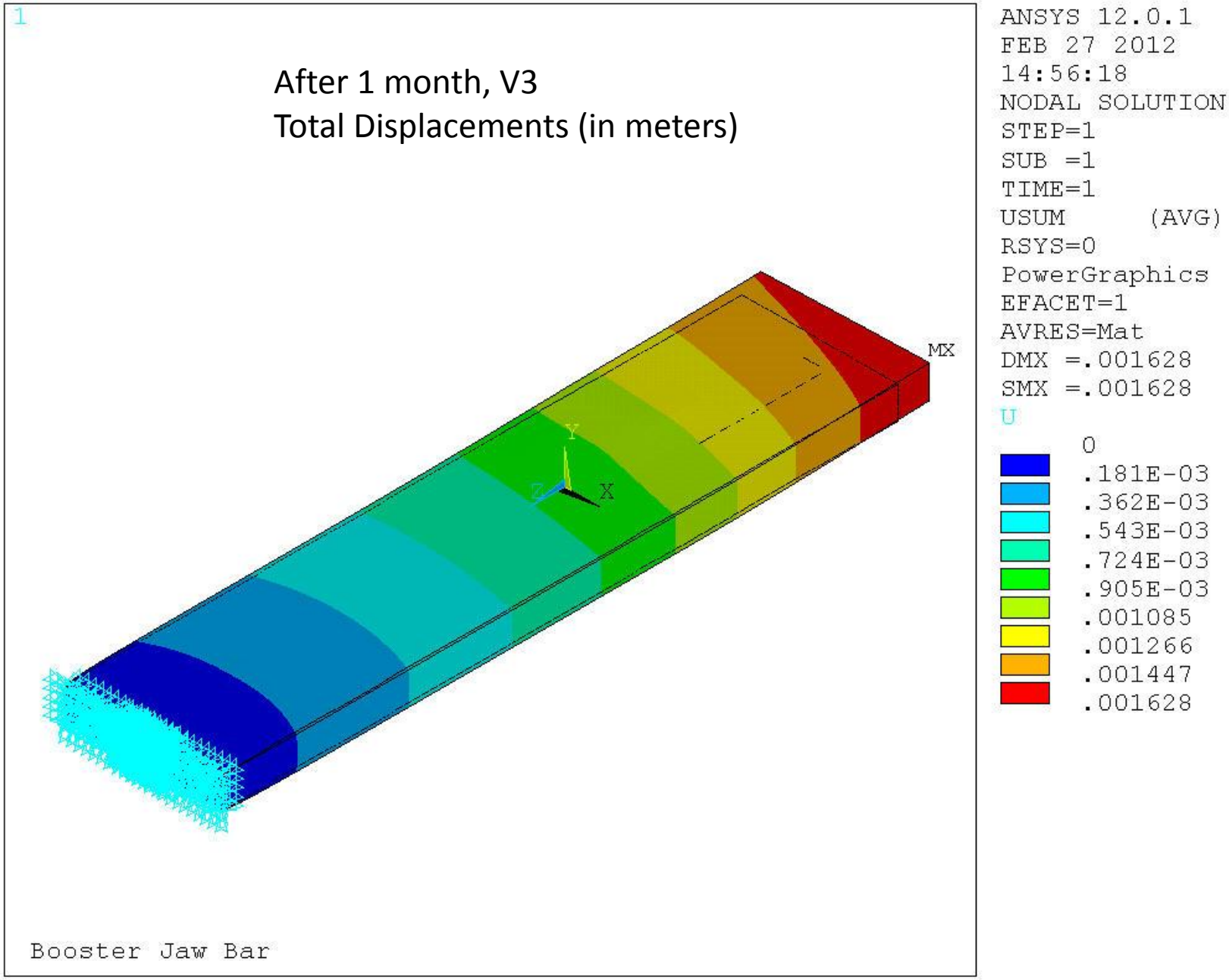
After 1 month, V3
10W/m2 on sides and ends
25C on hottest side y=0



Booster Jaw Bar

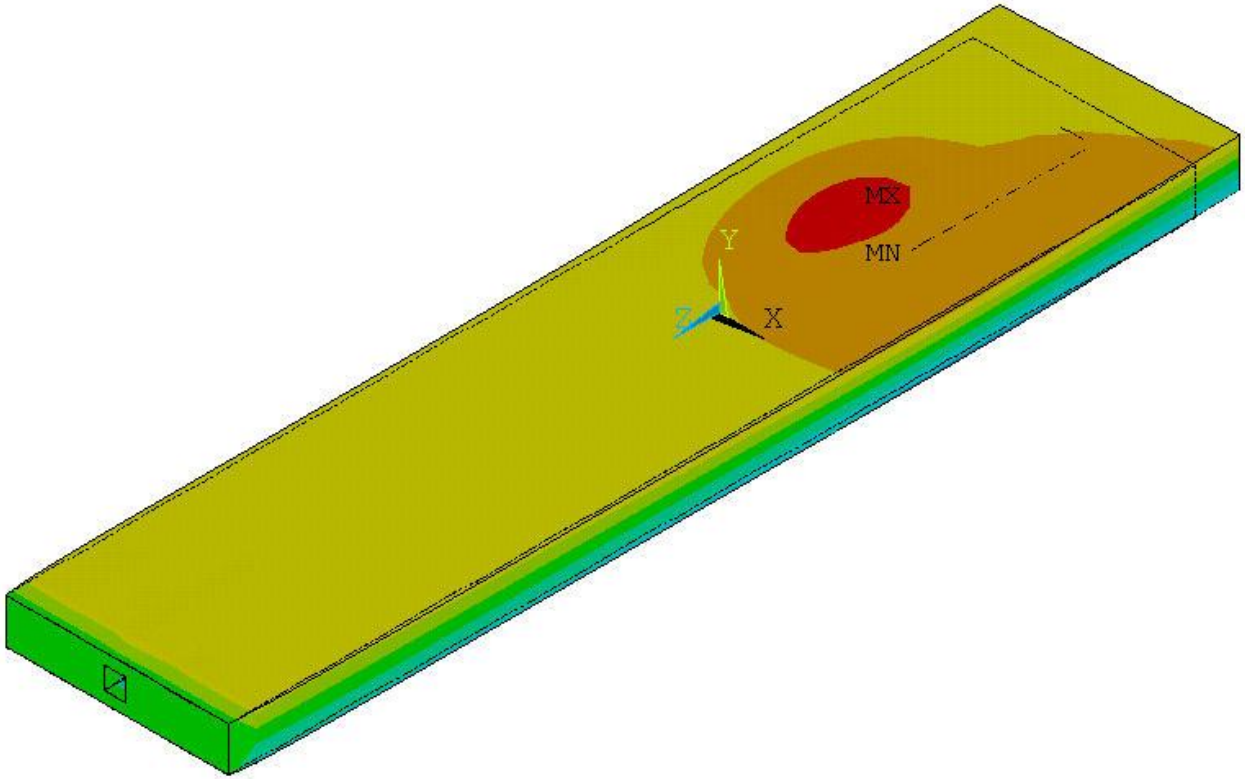
Model for Thermal Displacements




1
After 1 month, V3
Total Displacements (in meters)
MX
Y
Z
X
Booster Jaw Bar
ANSYS 12.0.1
FEB 27 2012
14:56:18
NODAL SOLUTION
STEP=1
SUB =1
TIME=1
USUM (AVG)
RSYS=0
PowerGraphics
EFACET=1
AVRES=Mat
DMX =.001628
SMX =.001628
U
0
.181E-03
.362E-03
.543E-03
.724E-03
.905E-03
.001085
.001266
.001447
.001628

1

After 1 month, V3
UY Displacements



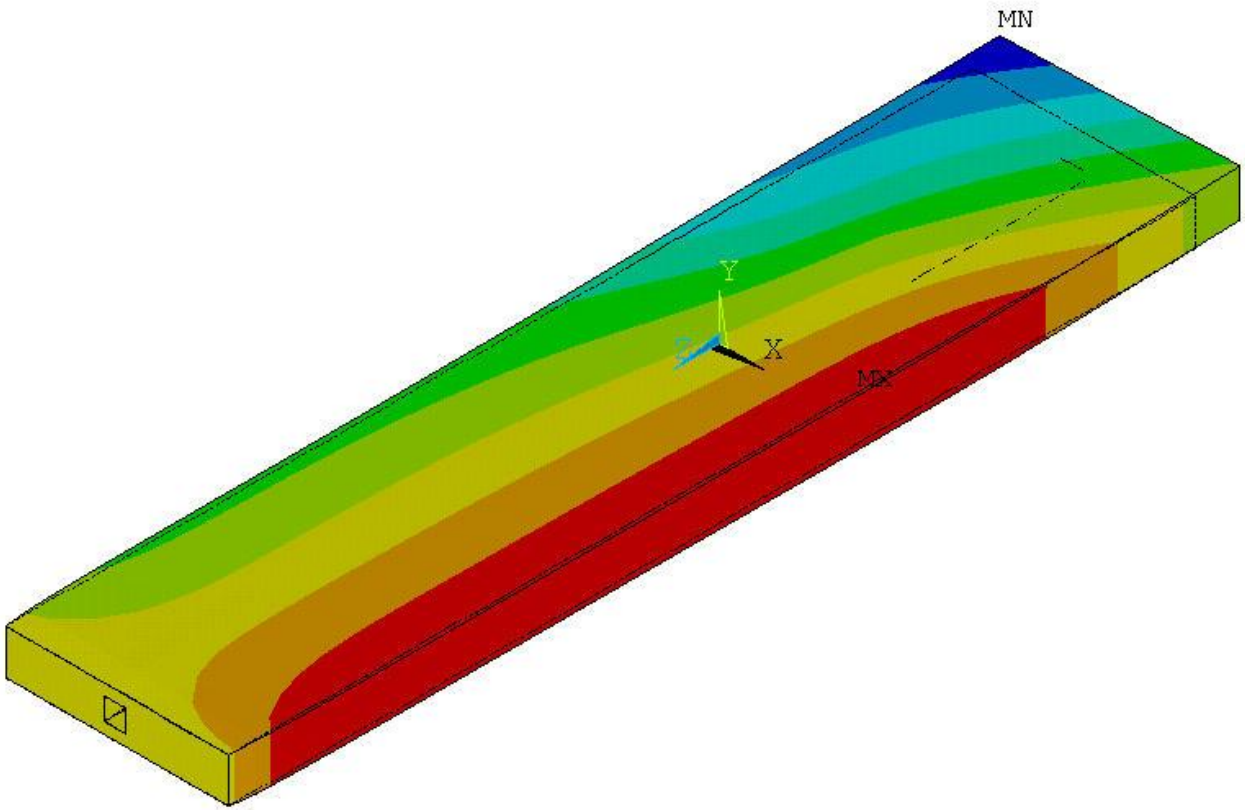
ANSYS 12.0.1
FEB 27 2012
14:49:36
NODAL SOLUTION
STEP=1
SUB =1
TIME=1
UY (AVG)
RSYS=0
PowerGraphics
EFACET=1
AVRES=Mat
DMX =.001628
SMN =-.705E-04
SMX =.706E-04

-.705E-04
-.549E-04
-.392E-04
-.235E-04
-.783E-05
.785E-05
.235E-04
.392E-04
.549E-04
.706E-04

Booster Jaw Bar

1

After 1 month, V3
UX Displacements



ANSYS 12.0.1
FEB 27 2012
14:51:44
NODAL SOLUTION
STEP=1
SUB =1
TIME=1
UX (AVG)
RSYS=0
PowerGraphics
EFACET=1
AVRES=Mat
DMX =.001628
SMN =-.473E-03
SMX =.155E-03

-.473E-03
-.403E-03
-.333E-03
-.264E-03
-.194E-03
-.124E-03
-.542E-04
.156E-04
.855E-04
.155E-03

Booster Jaw Bar

After 1 month, V3
UZ Displacements